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BOX PATENT APPLICATION
Washington, D.C. 20231

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Date of Deposit: _____ September 1-00

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Assistant Commissioner for Patents
Washington, D.C. 20231

By: _Ron Anton_____

Sir:

Transmitted herewith for filing under 37 CFR 1.53(b) is the
    [ ] patent application of
    [X] continuation patent application of
    [ ] divisional patent application of
    [ ] continuation-in-part patent application of

Inventor(s)/Applicant Identifier: Malcolm G. Smith, Sr.

For: DATA SYSTEM

[ ]   This application claims priority from each of the following Application Nos./filing dates:

_____ ,

the disclosure(s) of which is (are) incorporated by reference.

[ ]   Please amend this application by adding the following before the first sentence: "This application is a [X] continuation [ ] continuation-in-part of and claims the benefit of U.S. Application No. 60/_____, filed _____, the disclosure of which is incorporated by reference."

Enclosed are:
[X]   11___ page(s) of specification
[X]   5___ page(s) of claims
[X]   1___ page of Abstract
[X]   7___ sheet(s) of [X] formal [ ] informal drawing(s).
[X]   A [X] signed [ ] unsigned Declaration
[X]   A [X] signed Supplemental Declaration.
[X]   A Power of Attorney by Assignee with Certification.
[X]   A verified statement to establish small entity status under 37 CFR 1.9 and 37 CFR 1.27 [X] is enclosed [X] was filed in the prior application and small entity status is still proper and desired.
[X]   Preliminary Amendment canceling claims 1-30 and adding claims 31-40.
    The parent application was assigned to Card Tech, Inc.

FOR:	(Col. 1) NO. FILED	(Col. 2) NO. EXTRA	SMALL ENTITY RATE	FEE	OR	OTHER THAN SMALL ENTITY RATE	FEE
BASIC FEE				$345.00	OR		$690.00
TOTAL CLAIMS	10 - 20	= *0	x $9.00 =	$0.00	OR	x $18.00 =	
INDEP. CLAIMS	3 -3	= *0	x $39.00 =	$0.00	OR	x $78.00 =	
[ ] MULTIPLE DEPENDENT CLAIM PRESENTED			+ $130.00 =		OR	+ $260.00 =	
			TOTAL	$345.00	OR	TOTAL	

* If the difference in Col. 1 is less than 0, enter "0" in Col. 2.

Please charge Deposit Account No. 20-1430 as follows:
    [X]   Filing fee $_____$345.00_____
    [X]   Any additional fees associated with this paper or during the pendency of this application.
    [ ]   The issue fee set in 37 CFR 1.18 at or before mailing of the Notice of Allowance, pursuant to 37 CFR 1.311(b)

[ ]   A check for $_____ is enclosed.
2   extra copies of this sheet are enclosed.

Respectfully submitted,
TOWNSEND and TOWNSEND and CREW LLP
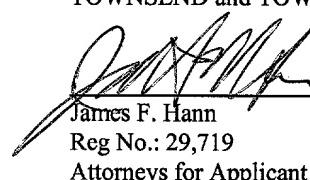
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PA 3093844 v1

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(c)) - SMALL BUSINESS CONCERN

Applicant or Patentee: ___Malcolm G. Smith, Sr.___
Application or Patent No.: ___09/113,783___
Filed or Issued: ___July 10, 1998___
Title: ___DATA SYSTEM WITH SUPPORT SURFACES FOR RECIPROCATING DATA HEAD___

I hereby declare that I am:

     [ ]   the owner of the small business concern identified below:
     [X]   an official of the small business concern empowered to act on behalf of the concern identified below:

Name of Small Business Concern: ___Card Tech, Inc.___
Address of Small Business Concern: ___P.O. Box 468___
         ___Bend, Oregon 97709___

I hereby declare that the above-identified small business concern qualifies as a small business concern as defined in 13 CFR 121.12, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees to the United States Patent and Trademark Office, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled __DATA SYSTEM WITH SUPPORT SURFACES FOR RECIPROCATING DATA HEAD__ by inventor(s) __Malcolm G. Smith, Sr.__ described in:

     []   the specification filed herewith.
     [X]   Application No. __09/113,783__, filed __July 10, 1998__.
     []   Patent No. _____, issued _____.

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights in the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern that would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e).

     *NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

Name _____
Address _____

     [] Individual   [] Small Business Concern   [] Nonprofit Organization

Name _____
Address _____

     [] Individual   [] Small Business Concern   [] Nonprofit Organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Name of Person Signing: ___Daniel P. Kehoe___
Title of Person if Other than Owner: ___President___
Address of Person Signing: ___P.O. Box 468___
         ___Bend, Oregon 97709___

Signature _____   Date __10-1-98__
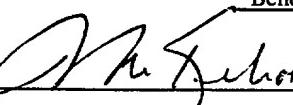
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

MALCOLM G. SMITH, SR.

Application No.:

Filed: Herewith

For: DATA SYSTEM

Examiner:

Art Unit:

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Before the first action in this case, please amend the application as follows:

<u>IN THE SPECIFICATION:</u>

Please change the title to --DATA SYSTEM--.

Please add the following before the section entitled "BACKGROUND OF THE INVENTION" on page 1 of the present application:

--CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. Patent Application No. 09/113,783, filed July 10, 1998, now U.S. Patent No. _____, which is a continuation of U.S. Patent Application No. 09/105,696, filed June 26, 1998, now abandoned, which is a continuation-in-part of U.S. Patent Application No. 07/871,447, filed April 21, 1992, now abandoned, which in turn is a continuation-in-part of U.S. Patent No. 5,107,099, which issued from an application filed April 24, 1989.--

Page 5, line 14, change "5D" to --5B--;

line 29, change "54" to --59--.

Page 7, lines 26, 34, 35 and 37, change "18" to --26-- each occurrence.

Page 9, line 29, delete "head support surface 24" and substitute --surface region 26--.

IN THE CLAIMS:

Please **cancel** claims 1-30 and **add** claims 31-40 as follows.

1   31.   (New) A data system comprising:

2   a data storage card having a data storage medium;

3   a housing comprising a panel;

4   an opening formed in the panel sized for passage of the card therethrough;

5   a card support movable between a load/unload position and a read/write

6   position;

7   card handler means for moving the card between the opening and the card

8   support;

9   a data head; and

10   means for moving at least one of the data head and the card support carrying the

11   card relative to one another, whereby the data head can read data from and/or write data to the

12   storage medium when the card support is at the read/write position.

1   32.   (New) The data system according to claim 31 wherein the moving

2   means causes the data head to move along parallel tracks along the storage medium.

1   33.   (New) The data system according to claim 31 wherein the parallel

2   tracks are constant-radius curved tracks.

1   34.   (New) A data unit, for use with a substrate having first and second

2   edges and a data surface region therebetween, comprising:

3   a base;

4   a substrate support, configured to support a substrate, mounted to the base;

5   a data head drive mounted to the base, the data head drive comprising a data

6   head reciprocally movable along a second path;

7   a step driver controllably moving the data head drive and the substrate support

8   relative to one another along a first path;

9   first and second data head support surfaces positioned at opposite ends of a

10   second path and adjacent to said substrate support, said first and second paths being transverse

11   to one another; and

12   said data head comprising a data head surface which contacts said first and

13   second data head support surfaces as said data head moves along the opposite ends of said

14   second path.

1   35.   (New) A method for reading and/or writing data from/to a plurality of

2   parallel data tracks on a substrate, comprising:

3   positioning a data head at a first position on the substrate;

4   moving the data head along a first data track on the substrate to permit reading

5   and/or writing of data from/to the first data track;

6   repositioning the data head to a second position on the substrate spaced-apart

7   from the first data track;

8   moving the data head along a second data track on the substrate to permit

9   reading and/or writing of data from/to the second data track; and

10   causing said moving steps to be carried out so that said first and second data

11   tracks are parallel data tracks.

1   36.   (New) The method according to claim 35 wherein the moving steps are

2   carried out in a manner that the first and second data tracks are curved, constant-radius data

3   tracks.

1   37.   (New) The method according to claim 35 wherein the repositioning step

2   is carried out by moving the data head in a direction generally perpendicular to the first data

3   tracks.

1   38.   (New) The method according to claim 36 wherein the moving steps are

2   carried out in a manner that the first and second data tracks are straight date tracks.

1   39.   (New) The method according to claim 38 wherein the repositioning step

2 is carried out by moving the data head in a direction generally perpendicular to the first data

3 tracks.

1   40.   (New) The method according to claim 36 further comprising continuing

2 to move the data head along extensions of the first and second data tracks, said extensions

3 passing adjacent to data head support surfaces.

REMARKS

Claims 31-40 remain in this case.

Independent **claims 31 and 35**, are supported by the disclosure of Smith patent

number 5,107,099 so that they obtain the benefit of the filing date of April 24, 1989 of the

Smith patent.

If the Examiner believes a telephone conference would expedite prosecution of

this application, please telephone the undersigned at (650) 326-2400.

Respectfully submitted,
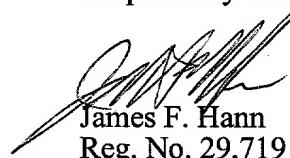
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PA 3093637 v1

PATENT APPLICATION

DATA SYSTEM

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Entity: Small

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DATA SYSTEM WITH SUPPORT SURFACES FOR RECIPROCATING DATA HEAD

BACKGROUND OF THE INVENTION

Digital data is stored in many forms. One data storage device uses spinning disks having a magnetic surface containing the digital data. The disks typically spin at a high rate of speed with the various tracks of data accessed by a radially movable data head. Another type of data storage device is the credit card having a magnetic stripe along one surface. However, such cards have limited storage capacity because of the nature of the magnetic stripe and the method of recording data onto the magnetic stripe.

SUMMARY OF THE INVENTION

The present invention is directed to a data system especially suited for use with credit card-type substrates which permits much more data to be written onto and read from the substrate than available with credit cards with conventional magnetic stripes.

The data system includes broadly a substrate, such as a credit card type substrate, and a data unit. The substrate has first and second edges and a data surface region between the edges. The data surface region is preferably plated or sputtered with nickel-cobalt as opposed to conventional credit cards which use ferrous oxide. The data unit includes a base supporting several components. A substrate support, which supports the substrate, is mounted to the base for controlled movement along a first path. The first path can be straight or curved. A data head drive is mounted to the base and includes a data head reciprocally movable along a second path. The first and second paths are generally transverse, typically perpendicular, to one another. The data head includes a data head surface which contacts the data surface region on the substrate. The data unit also

includes first and second data head support surfaces positioned along the second path adjacent to the first and second edges of the substrate. The data head surface also contacts the first and second data head support surfaces as the data head moves along the second path.

The data head support surfaces are preferably coplanar with the data surface region of the substrate. This provides a smooth transition for the data head between the data surface region and the data head support surfaces. The use of the data head support surfaces provides a region for the data head to accelerate and decelerate at each end of a pass over the data surface region so the data head can move over the data surface region at a constant surface speed.

The invention may also include a substrate handler including a substrate feeder, which delivers a substrate to and removes the substrate from the substrate support, and a substrate positioner, which automatically positions the substrate on, and secures the substrate to, the substrate support. The substrate positioner typically includes feed rollers and may also include a cleaner roller to clean the data surface region as the substrate passes through the substrate feeder.

Other features and advantages will appear from the following description in which the preferred embodiments have been set forth in detail in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a simplified plan view of a data unit made according to the invention;

Figs. 2A, 2B and 2C are front, side, and rear elevational views of the substrate of Fig. 1;

Fig. 3 is a side view illustrating the shape of the opening in the card entry of Fig. 1;

Fig. 4A is a simplified schematic view illustrating the card entry, card sensor and first feed rollers of the substrate feeder of Fig. 1;

Fig. 4B illustrates the components of Fig. 4A with a card being inserted through the card entry and through the card sensor, which activates the first feed rollers which will then grip the card as the user continues to insert the card through the card entry;

Figs. 5A and 5B are top plan and side elevational views of a portion of the substrate feeder of Fig. 1, but also illustrating a counter-rotating cleaning roller, not shown in Fig. 1 for clarity, with the card engaged by the first and second sets of feed rollers and the upper surface of the card being cleaned by the counter-rotating cleaning roller;

Figs. 6A and 6B illustrate movement of the card between the third feed rollers, past a sensor and towards the card support of the card support assembly of Fig. 1;

Fig. 7A is a simplified view illustrating the engagement of the bottom of a movable side registration member with a stud extending from the base when the card carriage, on which the card support is mounted, is at the load/unload position, the load/unload position being indicated by the card in dashed lines in Fig. 1;

Fig. 7B illustrates the release of the movable side registration member as the carriage begins to move away from the load/unload position towards the solid line position of Fig. 1, thus capturing the third and fourth edges of the card between the movable and stationary side registration members;

Figs. 8A and 8B are plan views of the card support and card showing how the card guide of Figs. 1 and 6A deflects the card into its fully loaded position as the carriage moves towards the solid line position of Fig. 1;

Figs. 9A and 9B illustrate the movement of a vertically deflecting spring which engages the bottom of the card as the carriage moves towards the solid line position of Fig. 1, thus securing the card against the inwardly extending lips of the stationary and movable side registration members;

Fig. 10 illustrates the extension of the push solenoid of Fig. 1 used to cause the card to reengage with the third feed rollers once the card is returned to the

load/unload of Fig. 7A position after a read/write procedure has been conducted; and

Fig. 11 is a simplified top plan view of a portion of an alternative embodiment of the invention in which the data head is mounted to the end of a pivotal arm which causes the read/write head to pass along an arcuate second path as opposed to the linear second path of the embodiment of Fig. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 illustrates, in a relatively simple schematic form, a data system 1 made according to the invention. Data system 1 comprises a data unit 2 and a substrate 3; substrate 3 is preferably in the form of a credit card-size card 3. Data unit 2 includes a base 4, which supports the various other components, a data head driver 6, which drives a data head 8 along a second path 10, a substrate or card support assembly 12, which moves card 3 or other substrate along a first path 14, and a substrate feeder 16, which drives card 3 to and from the substrate support assembly.

Card 3 is preferably a sandwich construction .51 mm (.020 inch) thick ceramic core and upper and lower surfaces made of a suitable plastic material about .13 mm (.005 inch) thick. Fig. 2A illustrates the front or bottom side 20 (relative to the figures) of card 3 having an embossed letter area 22 and a back, data or top side 24 having a data surface region 26 extending between first and second edges 28, 30 of the card.

Side 24 also preferably includes a magnetic, typically ferrous oxide, stripe 32 similar to that used with conventional credit cards. Data surface region 26 is preferably a magnetic region, and may also include ferrous oxide as a magnetic material. However, because of the use environment, to be discussed below, it is desired that region 26 be smooth and resistant to abrasion. This can be achieved in various conventional ways, such as by sputtering with carbon.

In the preferred embodiment of Figs. 2A-2C, only a portion of side 24 is covered by data surface region 26. In

some embodiments it may be desired to cover most or all of surface 24 with data surface region 26. A directional arrow 34 may also be included to aid the user in proper insertion of card 3 into card entry 36 shown in Figs. 1, 3, 4A

5   and 4B. As illustrated in Fig. 3, the opening 38 in card entry 36 has an enlarged portion to accommodate embossed letter area 22 shown in Figs. 2A and 2B.

       Figs. 4A and 4B illustrate a portion of substrate feeder 16, including card entry 36 mounted to the front

10   panel 40 of data unit 2. The user begins the read/write process by inserting a card 3 into opening 38 of card entry 36 sufficiently far to trip a light beam in a card sensor 42 which causes three sets of feed rollers 44, 46, and 48 to begin rotating as indicated by the arrows in Figs. 4B and 5D.

15   Feed rollers 44, 46, and 48 are driven by a feed system motor 50 through various pulleys 52 and belts 54. Once the user pushes card 3 far enough into unit 2 so that the first edge 28 of card 3 is captured at the nip of rollers 44, the feed rollers automatically move card 3 through substrate

20   feeder 16 as suggested by Figs. 5A-7A.

       Figs. 1, 5A and 5B illustrate the use of a magnetic stripe reader 56 which reads, in a conventional fashion, any information on magnetic stripe 32 as appropriate. Substrate feeder 16 also includes a counter-rotating cleaning roller 58.

25   Cleaning roller 58 is not shown in Fig. 1 for clarity. Cleaning roller 58 is used to ensure that data surface region 26 is clean of particles and debris prior to being accessed by data head 8. Substrate feeder 16 also includes a reflective sensor 54 which senses the presence of data surface

30   region 26. If card 3 has no data surface region 26, then feed rollers 44, 46 reverse the direction of card 3 and return it to the user with only magnetic stripe 32 having been read by magnetic stripe reader 56. Assuming card 3 includes a data surface region 26, feed rollers 44, 46, 48 continue the

35   movement of card 3 past optical sensor 61 and towards card support 60 of card support assembly 12.

       One end 62 of card support 60 is open to permit the free entry of card 3 onto the card support surface 64 of the

card support. Card support surface 64 has an opening 66
formed through the middle of the surface as will be described
below with reference to Figs. 9A and 9B. Referring now also
to Figs. 7A and 7B, card support 60 is seen to include a

5 stationary side registration member 68 and a movable side
registration member 70. Members 68 and 70 have overhanging
lips 72, 74. When card support 60 is in the load/unload
position of Figs. 6A, 6B and 7A, which corresponds to the
dashed-line position of card 3 in Fig. 1, movable side

10 registration member 70 is pivoted to its position of Fig. 7A
by the engagement of the lower end 76 of member 70 with a
stationary stud 78 extending upwardly from base 4. This
permits card 3 to be freely driven onto surface 64 of card
support 60 between registration members 68, 70. The initial

15 movement of assembly 12 along path 14 towards data head driver
6 causes registration member 70 to engage a fourth edge 81 of
card 3 and drive the third edge 79 of the card against
registration member 68.

First edge 28 of card 3 is driven against abutment
edge 80 of card support 60 by the movement of card support 60

20 along first path 14 towards data head driver 6, that is from
the dashed-line position to the solid-line position of Fig. 1.
Such movement along first path 14 causes second edge 30 of
card 3 to engage an angled card guide 82 which drives card 3
fully onto card support 60 as shown in Figs. 8A and 8B.

25 Abutment edge 80 is sized so that its upper edge 84, see Fig.
6B, is slightly below, such as .38 mm (.015 inch) below the
top surface 24 of card 3 when the card is pressed upwardly to
engage lips 72, 74 of members 68, 70 in the manner discussed

30 below.

Card support 60 is mounted to and is carried by a
carriage 86, the carriage being slidable along a pair of guide
shafts 88, the guide shafts being supported on base 4 by shaft
clamps 90, only one of which is shown in Fig. 1. Carriage 86,

35 and thus card support 60 with card 3 thereon, is driven along
first path 14 by a carriage motor 92.

The vertical movement or indexing of card 3 is
achieved by the use of a C-shaped spring 94 mounted to the

interior of carriage 86. An upper end 96 of spring 94 is aligned with and passes through opening 66 formed in card support surface 64 and illustrated in Fig. 6A. As carriage 86 moves along first path 14 from the load/unload position,

5   corresponding to the dashed-line position of Fig. 1, towards data head driver 6, spring 94 rides up onto a cam 98 extending upwardly from base 4. This causes card 3 to be biased upwardly against lips 72, 74 and held in place against inadvertent movement during read/write operations.

10   Returning again to Fig. 1, card 3 is shown with data head 8 at track "000" position. Data head 8 is preferably of the magnetic head contact-type which contacts data surface region as data head 8 is moved along second path 10. Data head 8 is mounted to the distal end of an arm 98 which is

15   mounted to a head carriage 100. Head carriage 100 is slidably mounted to a pair of guide shafts 102, the guide shafts mounted to a motor mount plate 104 by a pair of shaft clamps 106. Motor mount plate 104 is adjustably mounted to base 4 by four spacer mounts 108. Data head driver 6 also

20   includes a read/write head motor 110 which drives a pulley 112 in alternating clockwise and counter-clockwise directions. Pulley 112 is coupled to carriage 100 by a drive band 114 which passes around a pair of roller bearings 116 as well as pulley 112.

25   The position of data head 8 relative to data surface region 18 is provided by the rotary position of pulley 112 and by a sensor interrupter 118 being sensed by a pair of sensors 119. Sensors 119 are generally aligned with edges 28, 30 of card 3 when the card is in the read/write position of

30   Fig. 1.

           Second path 10 extends beyond first and second edges 28, 30 onto data head support surfaces 120, 122. Data head support surfaces 120, 122 are generally coplanar with data surface region 18 so that data head 8 moves smoothly from

35   region 18 onto support surfaces 120, 122. The use of support surfaces 120, 122 permits data head 8 to move across data surface region 18 at full speed. Preferably, data head 8 slows down, stops, reverses direction, and then speeds up for

each subsequent pass while on one of data surfaces 120, 122.
During this deceleration, stopping, reversal of direction, and
acceleration, carriage motor 92 has a chance to index card 3
one track width along first path 14. Therefore, by the time
5   data head 8 is ready to reengage data surface region 18, the
next track, which may or may not be the adjacent track, is
aligned with second path 10 and thus can be read by or written
to by data head 8. Data head support surface 120, 122 are
preferably low friction, low abrasion surfaces suitable for
10   the sliding movement of data head 8 thereover. To ensure
proper alignment, each data surface 120 is preferably provided
with appropriate height adjusters 124. The gap between
surfaces 120, 122 and card 3 is preferably small enough so
that data head 8 traverses the gap smoothly. If necessary
15   support at the gap can be provided by, for example, a small
jet of air.

Data head 8 is preferably at a rest position on data
head support surface 120 or data head support surface 122 when
card 3 is moved from a dashed-line to the solid-line positions
20   of Fig. 1. This keeps data head 8 from contacting side
registration member 68 during such movement. At the
completion of read/write operations, carriage 86 moves to the
load/unload position of Figs. 7A and 10 whereupon a push
solenoid 126 is actuated, see Figs. 10, to push card 3 until
25   the card is captured between third feed rollers 48. Push
solenoid 126 has a plunger 127 which passes through a gap 128
in abutment edge 80 to engage first edge 28 of card 3. Feed
rollers 44, 46 and 48, all rotating in the opposite direction
indicated in Fig. 5B, drive card 3 back through opening 38 in
30   card entry 36 to about the position of Fig. 4B.

In use, a user inserts a card 3 through opening 38
in card entry 36 whereupon substrate reader 16 drives it past
magnetic stripe reader 56 and to reflective sensor 59.
Assuming reflective sensor 59 senses the presence of data
35   surface region 26, rollers 46, 48 continue driving card 3
towards substrate support assembly 12. After card 3 has
passed third feed rollers 48, the inertia of the card causes
the card to continue moving onto support surface 64 of card

support 60. To ensure first edge 28 of card 3 abuts abutment edge 80 of card support 60, a card guide 82 is used to engage second edge 30 as card 3 moves from the load/unload position of Fig. 7A, that is the dash line position of Fig. 1, to the

5   read/write position, that is the solid line position of Fig. 1. Third edge 79 of card 3 is driven against stationary side registration member 68 by the pivotal movement of spring biased side registration member 70 during the initial movement of the card from the dashed-line position toward the solid-

10   line position of Fig. 1. Continued movement of card 3 toward the solid-line position of Fig. 1 causes spring 94 to be biased upwardly to drive card 3 upwardly until the lateral edges 79, 81 of the card engage lips 72, 74 of registration members 68, 70.

15   Once in the initial read/write position of Fig. 1, motor 110 drives data head 8 from one of data head support surfaces 120, 122 and data surface region 26 of card 3. In the preferred embodiment, motor 110 is designed to cause data head 8 to reach its desired speed of, for example, 318 cm per

20   second (125 inches per second) by the time data head 8 reaches card 3. It is desired that information on data surface region 26 be written at the rate of 36,000 bits per inch or greater. The density of the recording is determined by several factors, including the uniformity in movement at which

25   data head 8 passes over region 26, the construction of head 8, the construction of data surface region 6, the frequency of the read/write clock, and other conventional factors.

          At the end of each pass, while data head 8 is moving over data head support surface 24 during its deceleration,

30   stopping, reversal of direction, and acceleration, card 3 is indexed to the next track position to be accessed. If desired, the accessing of the track sequential or particular tracks can be selected, such as track 000, followed by track 023, followed by track 085, followed by track 031, etc.

35   The organization of the data recorded on data surface region 26 is dependent largely by the controller selected. The controller for unit 2 may be of a conventional type, such as one made by Realtec of San Diego, California and sold as

product number TCNGE09. In one embodiment, 350 tracks, each track having 56 sectors with 256 bytes per sector for a total 5,017,600 bytes, will be used.

5   When it is desired to remove card 3 from the unit, data head 8 is parked on one of the two support surfaces 120, 122 and then motor 92 drives carriage 86 back to the load/unload position at which point push solenoid 126 is actuated. Plunger 127, which passes through gap 128 in abutment edge 80, pushes card 3 until card 3 is engaged by

10   third rollers 48, at this time being rotated in directions opposite of the directions of Figs. 5B and 6B. Card 3 is then delivered to the user in substantially the position as indicated in Fig. 4B.

  In the preferred embodiment data head 8 physically

15   contacts data surface region 26 and support surfaces 120, 122. It may be possible to use a so-called flying head in which data head 8 would not contact data surface region 26. However, it is believed that the gaps at edges 28,30 would create turbulence causing the flying head to crash onto data

20   surface region 26. Also, the invention has been described with reference to magnetic, digitally encoded data. If desired, the data could be analog in nature and could be optical or magneto optical in character.

  Fig. 11 illustrates portions of an alternative

25   embodiment of the invention with like reference numerals referring to like elements. In this case, data unit 2A uses an oscillating data head 8A which passes along an arcuate second path 10A. Data head support surfaces 120A, 122A are positioned somewhat differently, but provide the same service:

30   support of data head 8A at each end of its movement. Sensors 119A indicate when data head 8 has passed from data surface region 26A so that data head 8 can begin its deceleration and reverse acceleration movement as card 3A is indexed along first path 14.

35   Other modifications and variation can be made to the disclosed embodiments without departing from the subject of the invention as defined in the following claims. For example, cleaning roller 58 could be replaced by or

supplemented by an air vacuum head or a pressurized air nozzle
to remove debris from data surface region 26.

WHAT IS CLAIMED IS:

1.   A data unit, for use with a substrate having first and second edges and a data surface region therebetween, comprising:

a base;

a substrate support, configured to support a substrate, mounted to the base for controlled movement along a first path;

first and second data head support surfaces positioned at opposite ends of a second path and adjacent to said substrate support, said first and second paths being transverse to one another;

a data head drive mounted to the base, the data head drive comprising a data head reciprocally movable along the second path; and

said data head comprising a data head surface which contacts said first and second data head support surfaces as said data head moves along the opposite ends of said second path.

2.   The data unit according to claim 1 wherein the substrate support is configured to support a substrate in the form of a rectangular card.

3.   The data unit according to claim 1 wherein the substrate support moves along the first path only.

4.   The data unit according to claim 1 wherein said second path is an arcuate path.

5.   The data unit according to claim 1 wherein said second path is a straight path.

6.   The data unit according to claim 1 wherein the data unit comprises a substrate handler, said substrate handler comprising:

4   a substrate feeder configured to deliver a substrate

5   to and remove the substrate from the substrate support; and

6   a substrate positioner configured to position the

7   substrate on and secure the substrate to the substrate

8   support.

1   7.   The data unit according to claim 6 wherein the

2   substrate feeder comprises feed rollers and at least one

3   substrate cleaner roller.

1   8.   The data unit according to claim 6 wherein said

2   substrate support is configured to support a rectangular

3   substrate having edges.

        9.   The data unit according to claim 8 wherein

substrate positioner comprises lateral edge guides mounted to

the substrate support and biased towards one another so a

substrate positioned between the edge guides has its edges

captured therebetween.

        10.   The data unit according to claim 9 wherein said

substrate positioner comprises means for separating the

lateral edge guides when said substrate support is moved along

the first track to a load/unload position so to permit a

5   substrate to be freely mounted to or removed from the

6   substrate support when at said load/unload position.

1   11.   The data unit according to claim 9 wherein said

2   lateral edge guides comprise overhanging lips configured to

3   overlie a substrate when said edge guides engage said edges.

1   12.   The data unit according to claim 11 wherein

2   said overlapping lips comprise substrate engaging surfaces

3   oriented generally coplanar with said data head support

4   surfaces.

1   13.   The data unit according to claim 6 wherein the

2   substrate support comprises a first edge limit surface

3   positioned to engage an edge of a substrate so to limit
4   movement of the substrate onto the substrate support.

1   14.   The data system according to claim 13 wherein
2   the substrate positioner comprises an edge guide, mounted to
3   the base, engagable with a second edge of a substrate so to
4   move the substrate against the first edge limit surface as the
5   substrate support is moved from a load/unload position, at
6   which the substrate is mountable to and removable from the
7   substrate support, towards a use position, at which the data
8   head moves along the second path.

1   15.   A data system comprising:
2   a substrate having first and second edges and a data
    surface region therebetween; and
3   a data unit comprising:
4   a base;
5   a substrate support, supporting the substrate,
    mounted to the base for controlled movement along a first
    path;
7   first and second data head support surfaces
10 positioned at opposite ends of a second path and adjacent to
11 said first and second edges of said substrate, said first and
12 second paths being tranverse to one another;
13   a data head drive mounted to the base, the data
14 head drive comprising a data head reciprocally movable along
15 said second path; and
16   said data head comprising a data head surface
17 which contacts said data surface region and said first and
18 second data head support surfaces as said data head moves
19 along said second path.

1   16.   The data system according to claim 15 wherein
2   said substrate comprises outer layers bonded to a center
3   layer.

17. The data system according to claim 16 wherein said outer layers comprise plastic material and the center layer comprises a ceramic material.

18. The data system according to claim 15 wherein said data surface region comprises nickel-cobalt.

19. The data system according to claim 15 wherein said data surface region extends to both said first and second edges.

20. The data system according to claim 15 wherein the first and second data head support surfaces are generally coplanar with the data surface region.

21. The data system according to claim 15 wherein the data unit comprises a substrate handler comprising:
a substrate feeder which delivers the substrate to and removes the substrate from the substrate support; and
a substrate positioner, which properly positions the substrate on and secures the substrate to the substrate support.

22. The data system according to claim 21 wherein said substrate feeder comprises a data surface region sensor for sensing said data surface region.

23. The data system according to claim 22 wherein the substrate comprises a magnetic stripe region and the substrate reader comprises a magnetic stripe reader for reading information from the magnetic stripe region.

24. The data system according to claim 21 wherein said substrate support is configured to support a rectangular substrate having edges.

25. The data system according to claim 24 wherein substrate positioner comprises lateral edge guides mounted to

3 the substrate support and biased towards one another so the
4 substrate positioned between the edge guides has its edges
5 captured therebetween.

1   26. The data system according to claim 25 wherein
2 said substrate positioner comprises means for separating the
3 lateral edge guides when said substrate support is moved along
4 the first track to a load/unload position so to permit the
5 substrate to be freely mounted to or removed from the
6 substrate support when at said load/unload position.

1   27. The data unit according to claim 25 wherein
2 said lateral edge guides comprise overhanging lips configured
3 to overlie a substrate when said edge guides engage said
4 edges.

1   28. The data system according to claim 27 wherein
2 said substrate positioner comprises means for biasing a
3 substrate against the overhanging lips to position the data
4 surface region to be generally coplanar with the acceleration
5 surfaces.

1   29. The data system according to claim 21 wherein
2 the substrate support comprises a first edge limit surface
3 positioned to engage an edge of the substrate so to limit
4 movement of the substrate onto the substrate support.

1   30. The data system according to claim 29 wherein
2 the substrate positioner comprises an edge guide, mounted to
3 the base, engagable with a second edge of a substrate so to
4 move the substrate against the first edge limit surface as the
5 substrate support is moved from a load/unload position, at
6 which the substrate is mountable to and removable from the
7 substrate support, towards a use position, at which the data
8 head moves along the second path and contacts the data surface
9 region.

DATA SYSTEM WITH SUPPORT SURFACES FOR RECIPROCATING DATA HEAD

ABSTRACT OF THE DISCLOSURE

5   A data system (1) includes a credit card type substrate (3) and a data unit (2). The substrate has first and second edges (28, 30) and a data surface region (26) between the edges. The data unit includes a base (4), a substrate support (60) mounted to the base for controlled

10   movement along a first path (14), and a data head driver (6), also mounted to the base, including a data head which reciprocates along a second path (10) oriented perpendicular to the first path. The data head contacts the data surface region on the substrate and first and second data head support

15   surfaces (120, 122) located at opposite ends of the second path adjacent to the first and second edges of the substrate. The data head support surfaces and the data surface region are coplanar. The data unit also includes a substrate feeder (16), which delivers the substrate to and removes the

20   substrate from the substrate support, and a substrate positioner (68, 70, 82, 94, 98), which properly positions the substrate on and secures the substrate to the substrate support.

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FIG. I.

FIG. 2A.

FIG. 2B.

FIG. 2C.

FIG. 3.

FIG. 4A.

FIG. 4B.
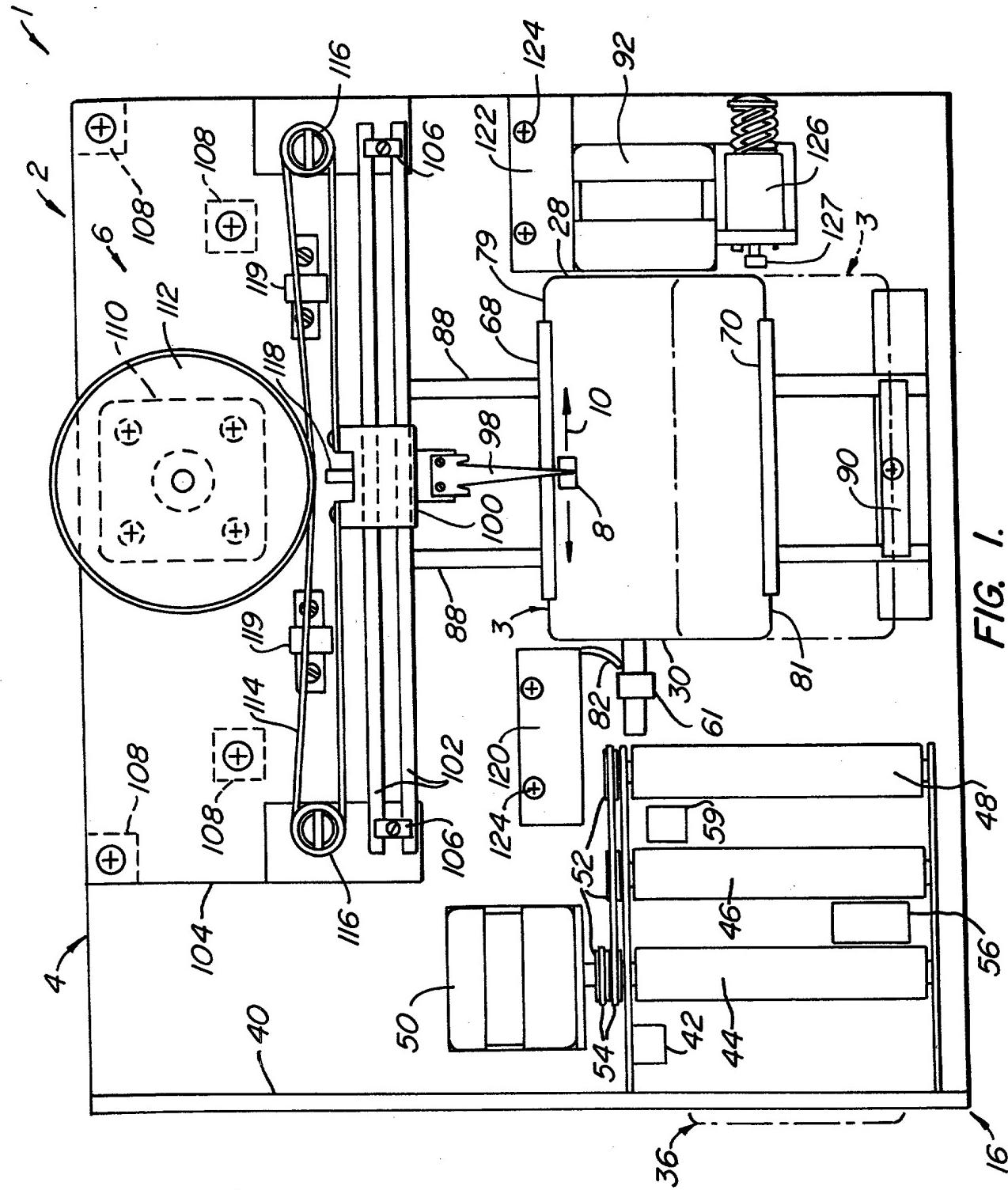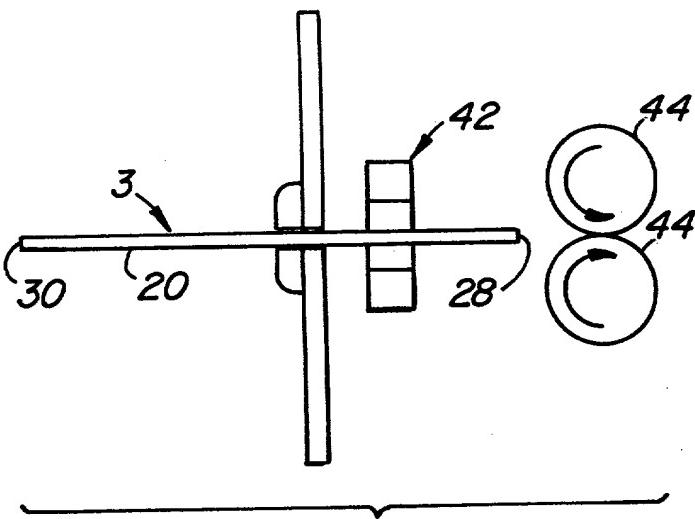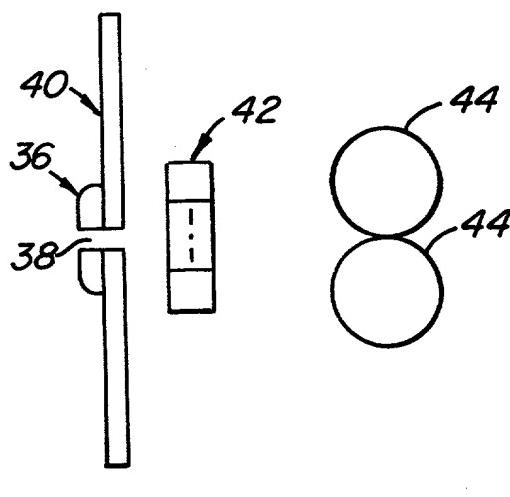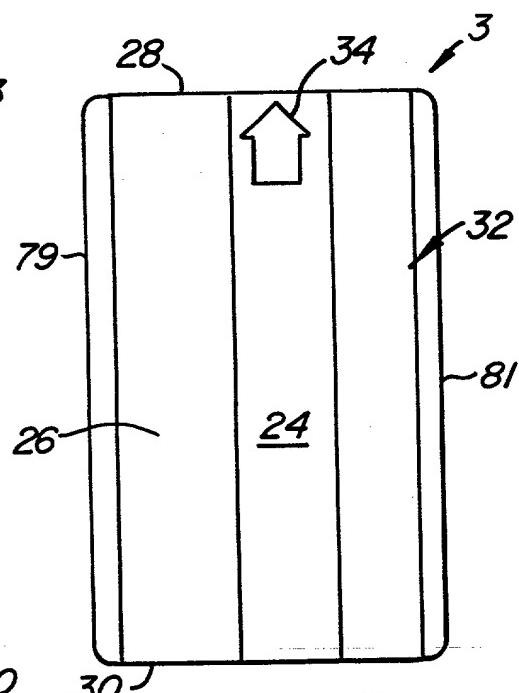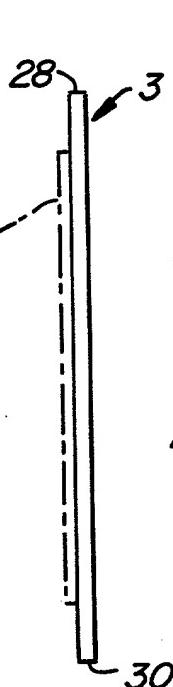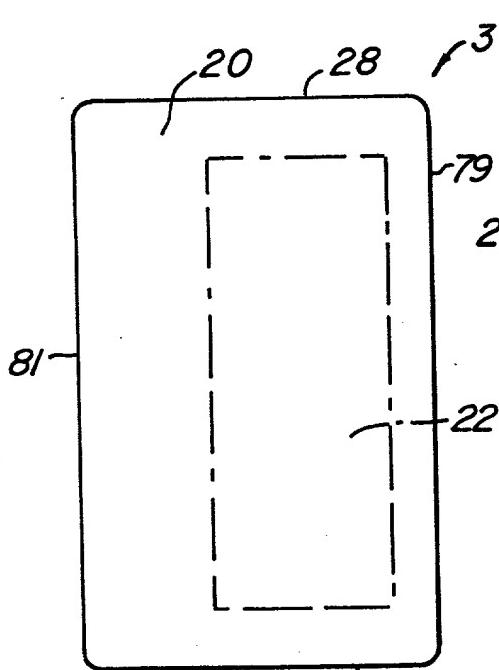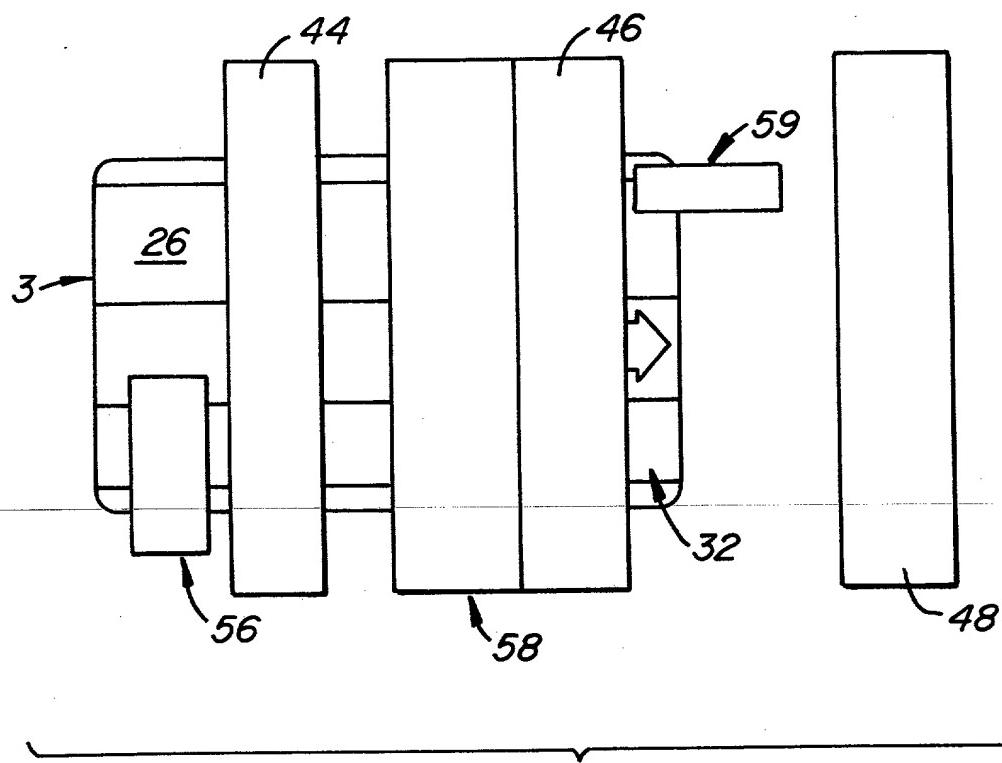
FIG. 5A.

FIG. 5B.

FIG. 6A.

FIG. 6B.

FIG. 7B.

FIG. 8B.

FIG. 7A.

FIG. 8A.
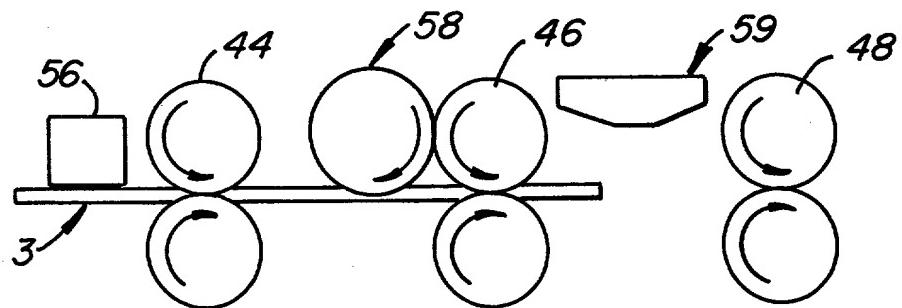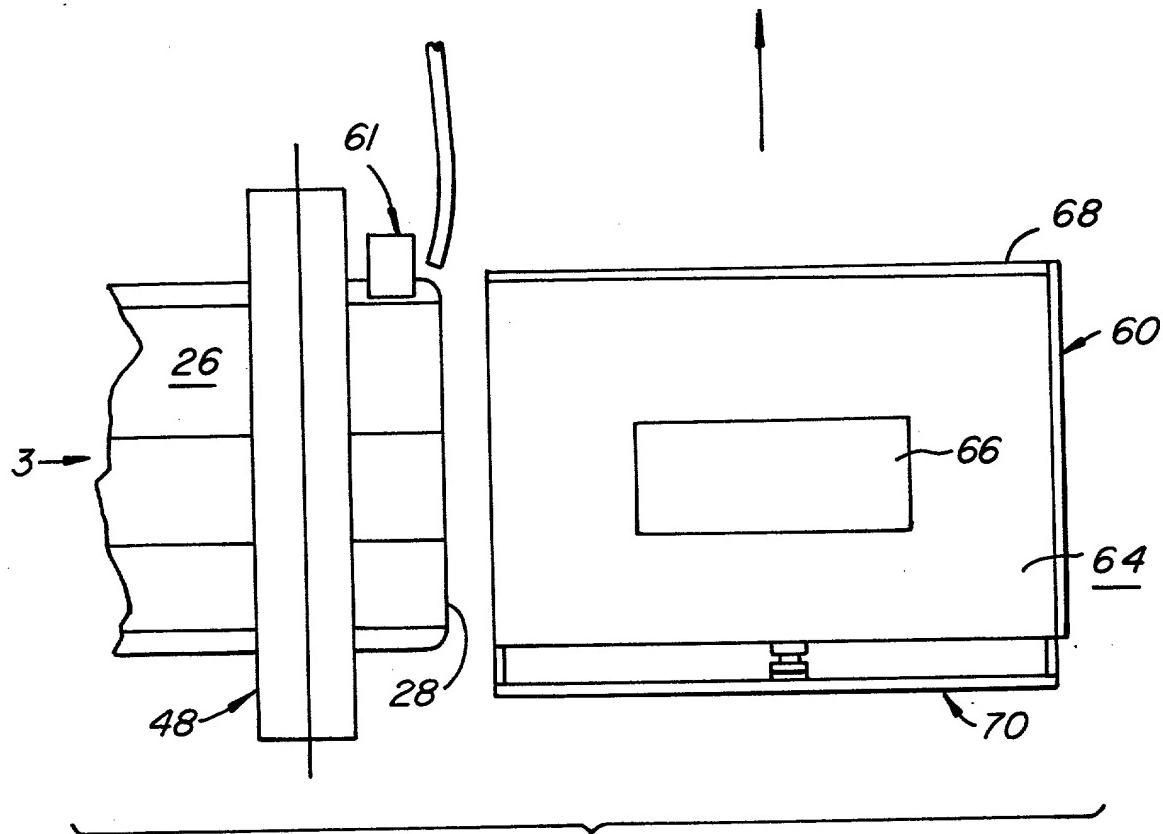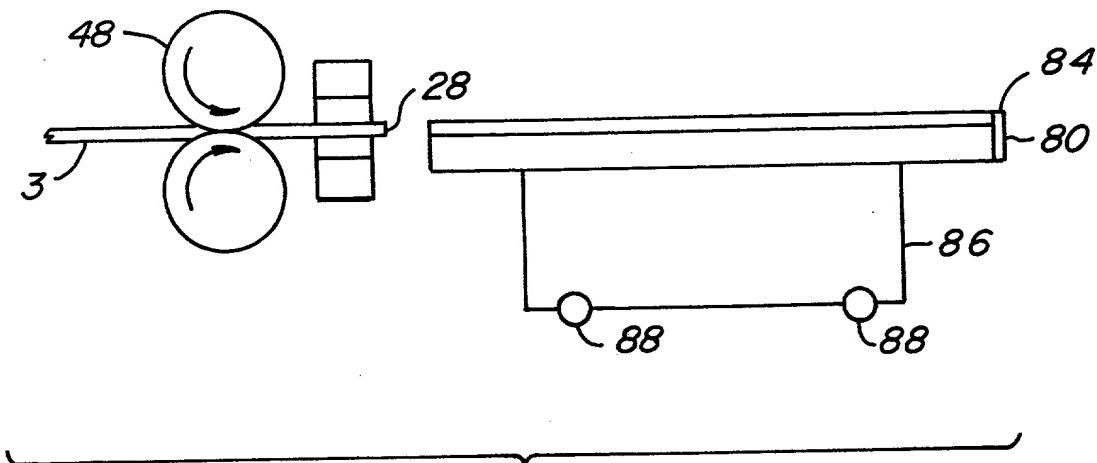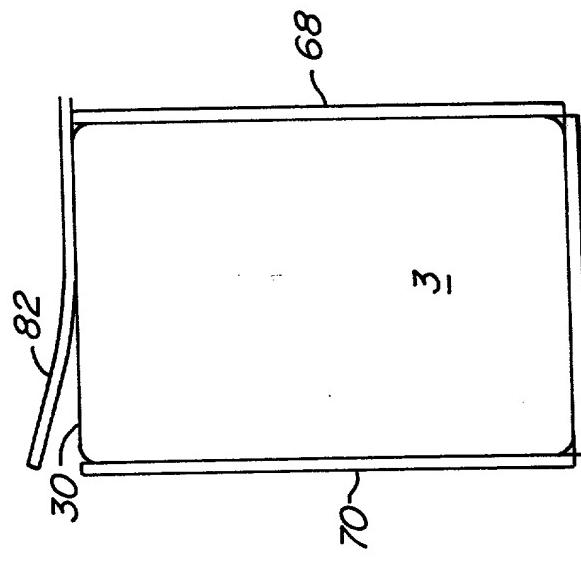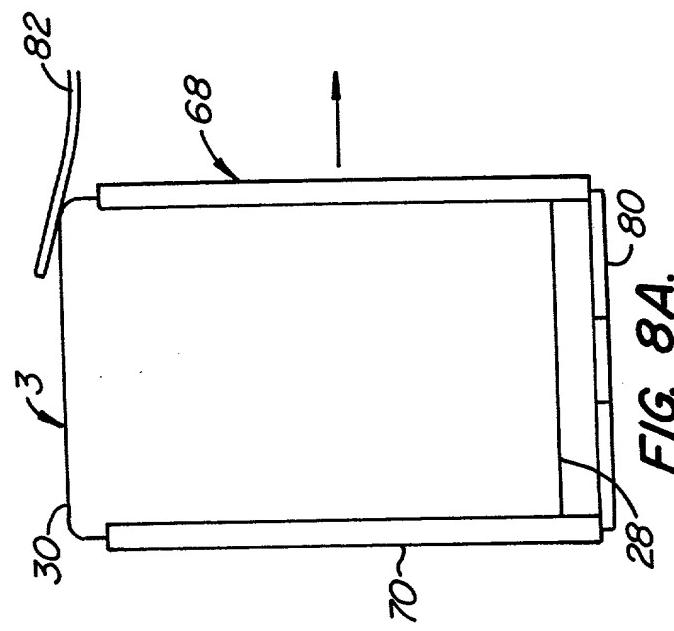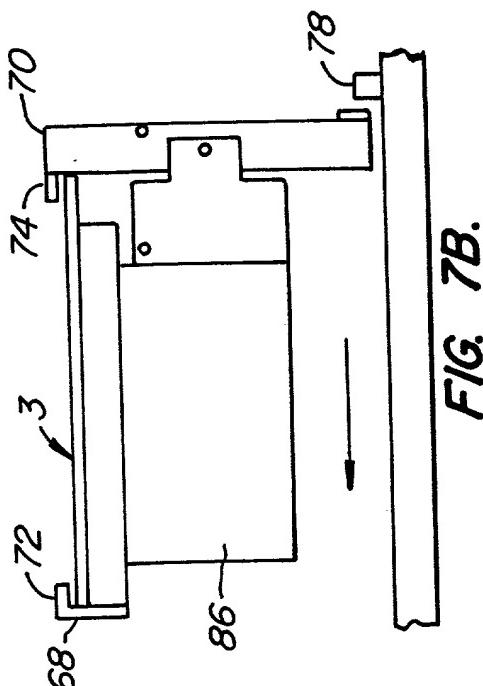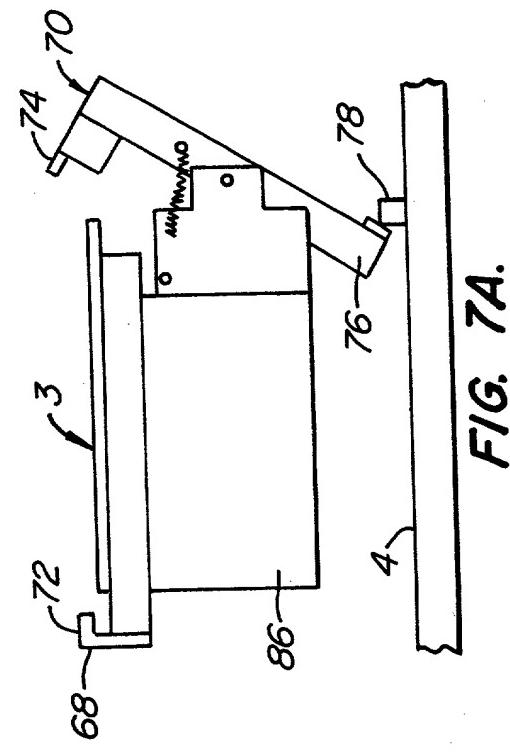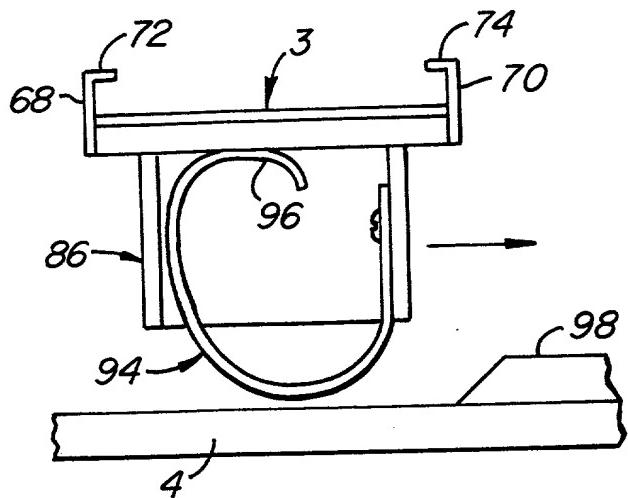
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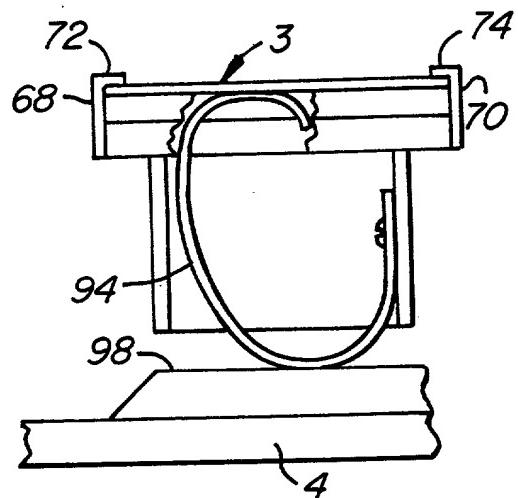

FIG. 9B.
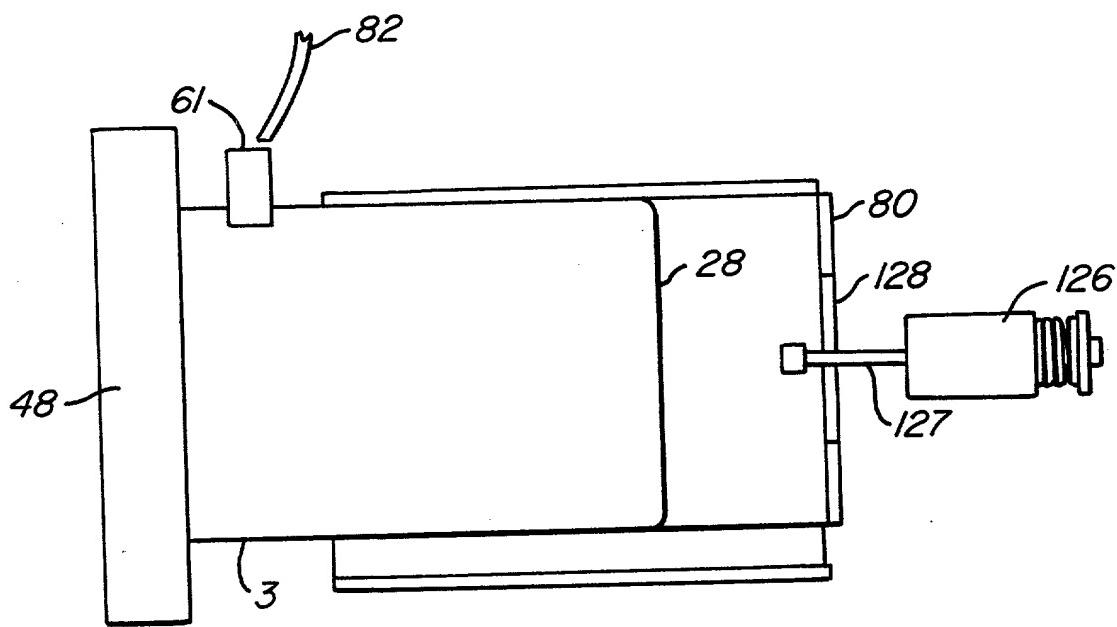
FIG. 10.
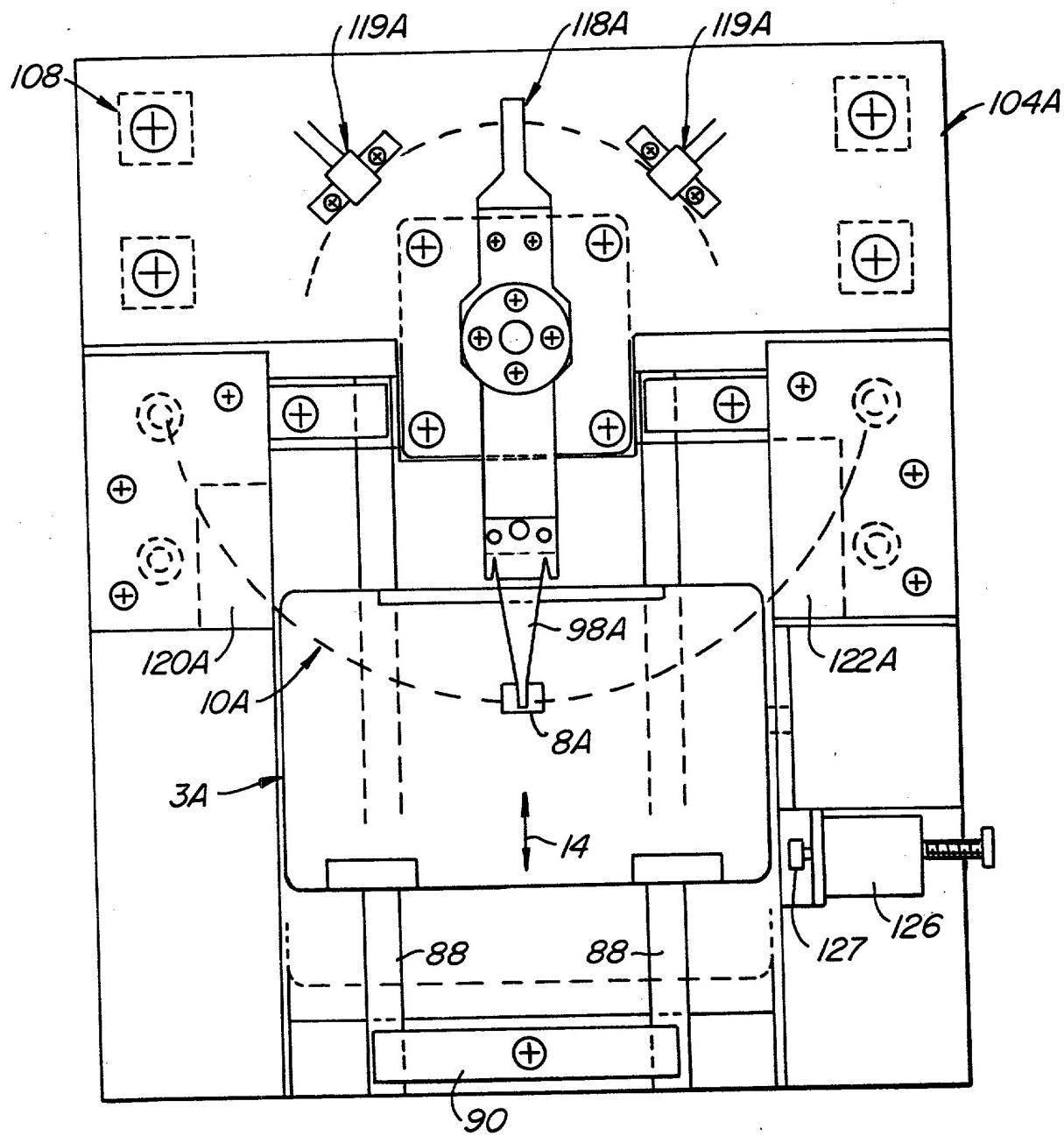
FIG. II.

DECLARATION

As a below named inventor, I declare that:

My residence, post office address and citizenship are as stated below next to my name; I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: **DATA SYSTEM WITH SUPPORT SURFACES FOR RECIPROCATING DATA HEAD**, the specification of which __X__ is attached hereto or ___ was filed on ___ _____ as Application No. _____ and was amended on ___ (if applicable).

I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56. I claim foreign priority benefits under Title 35, United States Code, Section 119 of any foreign applications(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

Country	Application No.	Date of Filing	Priority Claimed Under 35 USC 119
			Yes __ No __
			Yes __ No __

I hereby claim the benefit under Title 35, United States Code §119(e) of any United States provisional application(s) listed below:

Application No.	Filing Date

I claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, section 1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application No.	Date of Filing	Status
		__ Patented __ Pending __ Abandoned
		__ Patented __ Pending __ Abandoned

Full Name of Inventor 1	Last Name SMITH, Sr.	First Name MALCOLM	Middle Name or Initial G.	
Residence & Citizenship	City ~~Mulege, BCS~~ GOLD HILL	State/Foreign Country ~~Mexico~~ OREGON	Country of Citizenship U.S.A.	
Post Office Address	Post Office Address 636 UPPER ~~La Fortuna, Calle la Playa~~ RIVER ROAD	City ~~Mulege, BCS~~ GOLD HILL	State/Country ~~Mexico~~ OR	Zip Code 97525
Full Name of Inventor 2	Last Name ///	First Name	Middle Name or Initial	
Residence & Citizenship	City	State/Foreign Country	Country of Citizenship	
Post Office Address	Post Office Address	City	State/Country	Zip Code
Full Name of Inventor 3	Last Name ///	First Name	Middle Name or Initial	
Residence & Citizenship	City	State/Foreign Country	Country of Citizenship	
Post Office Address	Post Office Address	City	State/Country	Zip Code

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signature of Inventor 1 *Malcolm G. Smith, Sr.* MALCOLM G. SMITH, Sr.	Signature of Inventor 2 ///	Signature of Inventor 3 ///
Date JUNE 24, 1998	Date	Date

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SUPPLEMENTAL DECLARATION

As a below named inventor, I declare that:

My residence, post office address and citizenship are as stated below next to my name; I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: **DATA SYSTEM WITH SUPPORT SURFACES FOR RECIPROCATING DATA HEAD,** the specification of which ___ is attached hereto or _X_ was filed on _July 10, 1998_ as Application No. _09/113,783_ and was amended on ___ (if applicable).

I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56. I claim foreign priority benefits under Title 35, United States Code, Section 119 of any foreign applications(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

Country	Application No.	Date of Filing	Priority Claimed Under 35 USC 119
			Yes __ No __
			Yes __ No __

I hereby claim the benefit under Title 35, United States Code §119(e) of any United States provisional application(s) listed below:

Application No.	Filing Date

I claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, section 1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application No.	Date of Filing	Status
		__ Patented __ Pending __ Abandoned
		__ Patented __ Pending __ Abandoned

Full Name of Inventor 1	Last Name SMITH, Sr.		First Name MALCOLM	Middle Name or Initial G.	
Residence & Citizenship	City Gold Hill		State/Foreign Country Oregon	Country of Citizenship U.S.A.	
Post Office Address	Post Office Address 636 Upper River Road	City Gold Hill		State/Country Oregon	Zip Code 97525
Full Name of Inventor 2	Last Name ///		First Name	Middle Name or Initial	
Residence & Citizenship	City		State/Foreign Country	Country of Citizenship	
Post Office Address	Post Office Address	City		State/Country	Zip Code
Full Name of Inventor 3	Last Name ///		First Name	Middle Name or Initial	
Residence & Citizenship	City		State/Foreign Country	Country of Citizenship	
Post Office Address	Post Office Address	City		State/Country	Zip Code

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signature of Inventor 1	Signature of Inventor 2	Signature of Inventor 3
Malcolm G. Smith, Sr. MALCOLM G. SMITH, Sr.	///	///
Date *Sept. 15, 1998*	Date	Date

POWER OF ATTORNEY BY ASSIGNEE

CARD TECH INC., P.O. Box 468, Bend, Oregon, is the Assignee of the invention entitled:

DATA SYSTEM WITH SUPPORT SURFACES FOR RECIPROCATING DATA HEAD

the specification of which is filed herewith.

The Assignment accompanying this Power of Attorney has been reviewed by the undersigned. The undersigned certifies that to the best of the undersigned's knowledge and belief, title is in the Assignee. The undersigned (whose title is supplied below) is empowered to act on behalf of the Assignee.

Assignee hereby appoints the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

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James M. Heslin, Reg. No. 29,541	Mark D. Barrish, Reg. No. 36,44
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Robert C. Colwell, Reg. No. 27,431	Randolph T. Apple, Reg. No. 36,429
Paul C. Haughey, Reg. No. 31,836	John R. Storella, Reg. No. 32,944
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CARD TECH INC.

Date: /0 -/- 9Y

By: _____
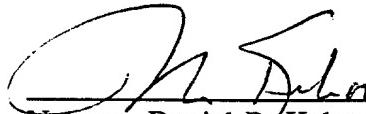
Name: Daniel P. Kehoe

Title: President

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